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TO: Bill Backous and Diane Harvester, WQP, Southwest Regional Office  
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THROUGH: Will Kendra, EILS *WK*

FROM: Randy Coots, EILS *RC*

SUBJECT: Annual Report for the Black River Nonpoint TMDL Study

### INTRODUCTION

The Chehalis River has long suffered a range of water quality problems from both point and nonpoint sources of pollution. In 1990 EILS conducted a screening level survey to better define the basin and ultimately establish a total maximum daily load (TMDL) for the river. The two most notable problems identified in the screening survey were low dissolved oxygen (DO) in the Chehalis River during low flow and fecal coliform loading to the Black River during high flow. Currently, in response to the identified problems, EILS has two TMDL studies ongoing in the basin.

Described here is an interim report of first year data for the high flow nonpoint TMDL in the Black River. It is a brief summary which reports rainfall and fecal coliform results and compares fecal coliform results to water quality criteria. Explanations of second season sampling modifications are included.

### METHODS

Fecal coliform samples were collected from 11 Black River sites at approximately river mile (RM) 1.1, 4.2, 7.3, 10.6, 11.3, 12.7, 15.3, 16.6, 18.7, 19.1, and 21.5 (Figure 1). In addition, three major tributaries were sampled: Mima, Beaver, and Waddell Creeks. Samples were collected from center of flow at wrist depth in 250 mL autoclaved glass bottles, immediately placed on ice, and analyzed by the membrane filter method within 24 hours. Tributary samples were collected near the point of discharge to the Black River. Field surveys were scheduled weekly between December 1991 and March 1992. Bacterial samples were accepted at the lab from Monday through Thursday. Sampling was initiated when rainfall accumulations were  $\geq 0.5$  inches over the five day antecedent period. Additional survey parameters that were monitored included temperature, conductivity, and discharge.

Fecal coliform, as with other physical and biological parameters, tends to have higher variability in the environment. In an effort to reduce this variability, all samples were collected in replicate (*i.e.* one sample collected after the other). The reported values are means of the replicate pairs. Variability of the first wet season replicate pairs for the total data set, data exceeding water quality standards, and data below water quality standards was 27%, 16%, and 29%, respectively.

A more detailed description of sampling methods will be included in the final report, due out in draft form by June 1993.

## FINDINGS

1. Table 1 summarizes fecal coliform results for the Black River Nonpoint TMDL Study, while Table 2 reports weekly results. Figure 2 graphically displays survey results for fecal coliform, daily rainfall, and rainfall totals versus the expected normal rainfall for the wet season survey period. As shown in Figure 2, fecal coliform results followed the trend of rainfall events. With nonpoint source pollution this would be expected. During periods of wet weather, wash-off of contaminants occurs following rain events. With the low number of substantial storms and less than expected rainfall for the sample season, it appears this first sampling year was not a normal wet season. Precipitation averaged more than 4 inches behind normal for the survey period, and only 12 rain events exceeded a 0.5 inch accumulation in 24 hours, with 7 occurring within a 10 day period. Normally one could expect 17 events with at least 0.5 inches of rainfall accumulation in 24 hours for this period.
2. Fecal coliform sampling for the Black River Nonpoint TMDL found few exceedances of state water quality standards. Counts were generally low except for samples collected January 28, which followed the season's largest storm event. Results were lower than reported by other surveys in the recent past, including the screening survey performed by EILS in 1990 and monitoring by the Black River Watch, a group under the direction of Thurston County Environmental Health, in 1991. Again, rainfall was unusually low during the study period, likely due to El Nino. Higher results are expected during a more typical wet season runoff period.
3. Two sites on the Black River exceeded the state Class A water quality standard which specifies that not more than 10% of samples exceed 200 colonies/100 mL: the site at Mima Creek (3 of 10 samples), and the site at Swecker's dock (2 of 10 samples). One tributary site, Beaver Creek, exceeded state water quality standards with a geometric mean of 154 colonies/100 mL. Generally, Beaver Creek had the highest fecal coliform concentration for individual sample runs. The exceptions to this were three events at the upstream Mima Creek site.

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4. In an effort to better characterize fecal coliform loading from run-off, second wet season sampling surveys will have a modified design. The antecedent period will be shortened from 5 to 2 days requiring  $\geq 0.5$  inches of rainfall. I have also requested more flexibility regarding days the lab will accept bacterial samples. This year samples will be collected from Sunday through Friday instead of Sunday through Wednesday. These two changes should improve definition of fecal coliform wash-off from the basin. Replicate fecal coliform sampling at all sites will be reduced to 10% of samples for QA purposes and replicate *E. coli* sampling will be added to compare Washington State water quality standards to Federal water quality standards. Year one estimates of fecal coliform variability will be applied to year two results. In this second year I also plan to extend sampling up subdrainages suspected as problem areas (*i.e.* Beaver and Mima Creeks) in an effort to more clearly identify contaminant sources.

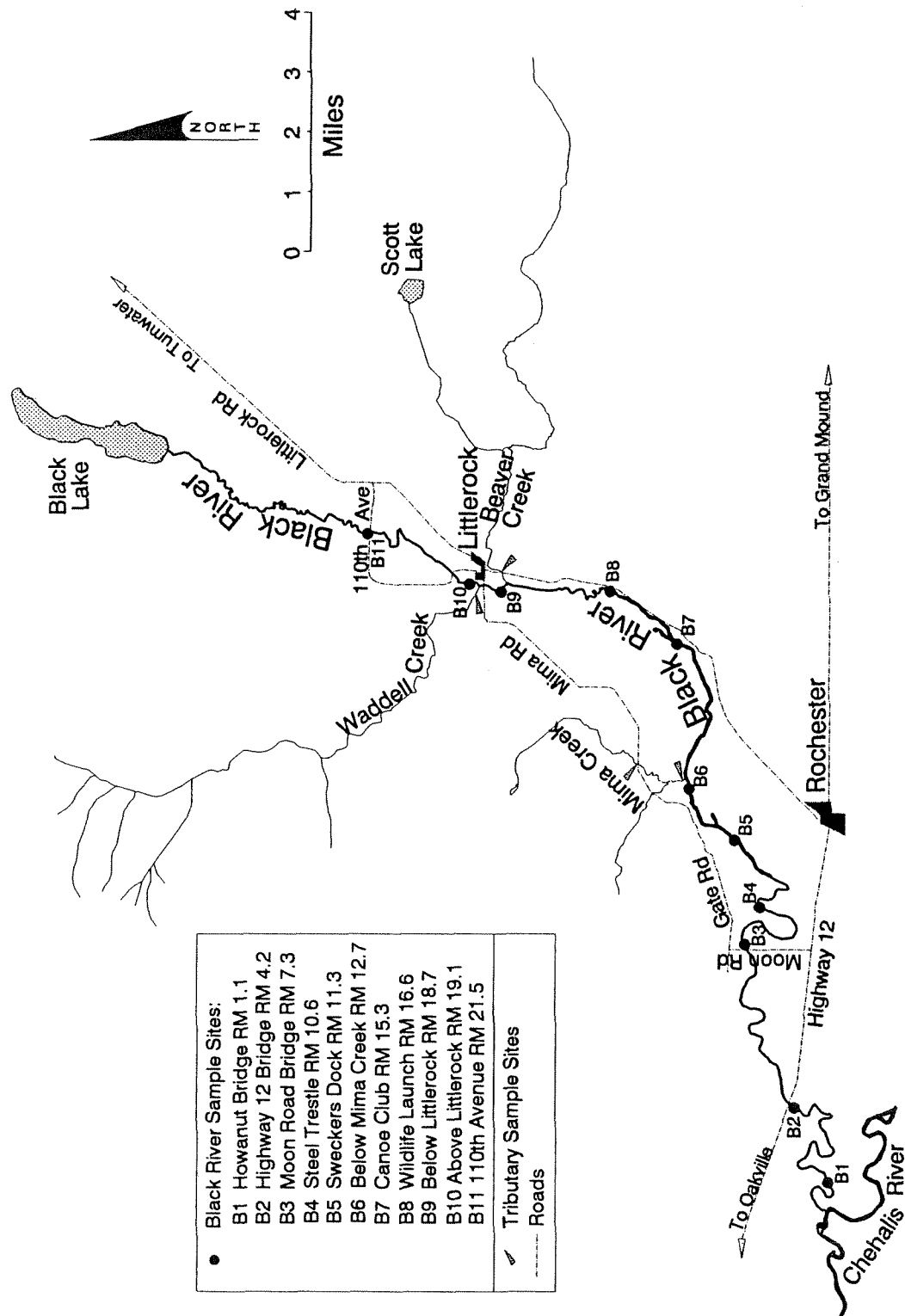
I am also planning to apply a GIS model in the Black River Nonpoint TMDL project during this next year. The model will use GIS land use coverage in combination with fecal coliform runoff/loading functions to estimate problem sub-basins in the drainage. These projected problem areas will then be compared to year one and two survey findings to evaluate if land use correlates with bacterial loading in this drainage.

If any of the information presented here is unclear or you would like further discussion please call me at 586-7070.

RC:blt

cc: Steve Butkus  
Joe Joy

Figure 1. Black River and Major Tributary TMDL Study Sites



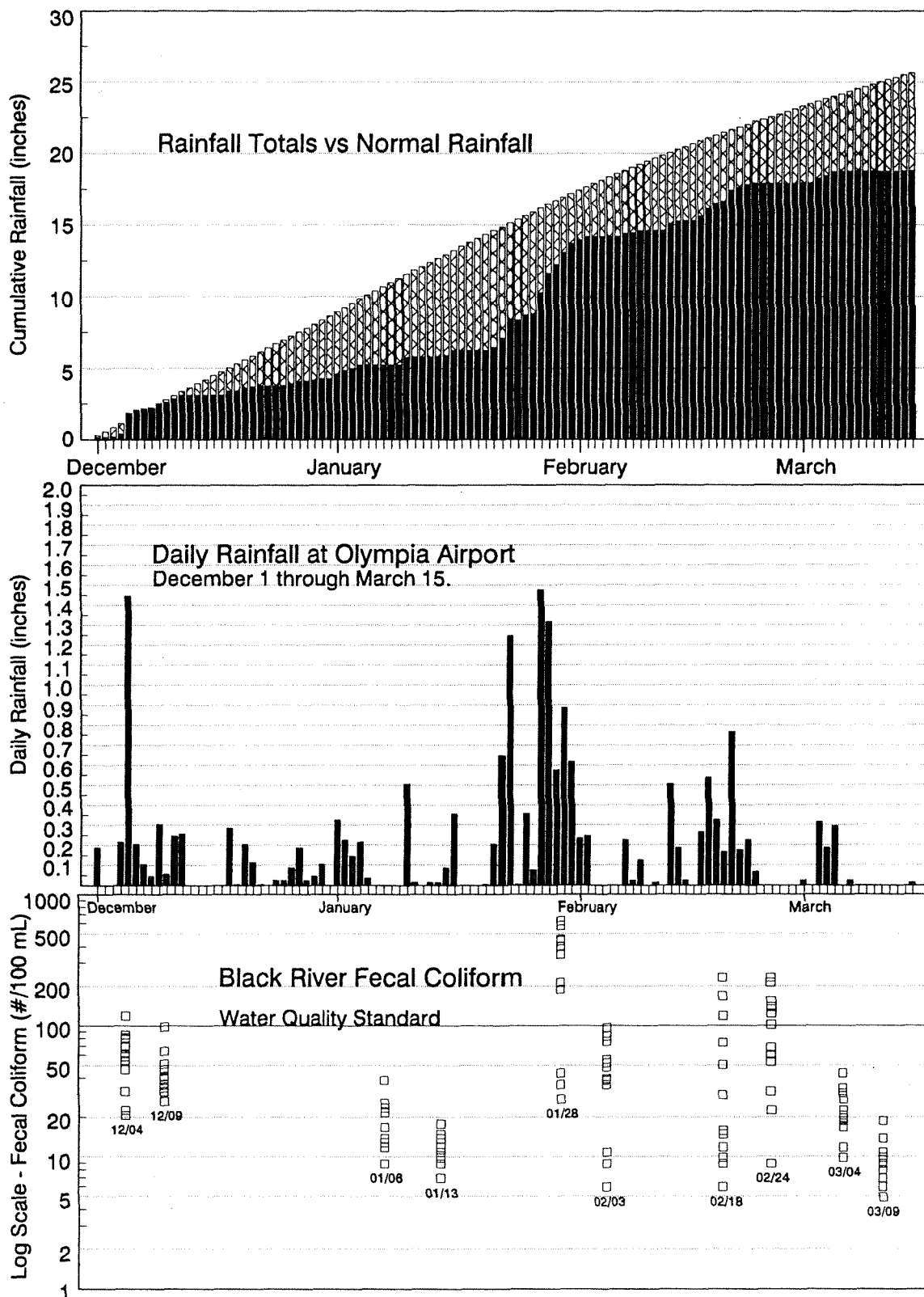


Figure 2. Rainfall and Fecal Coliform Results for the Black River TMDL

Table 1. Summary of year one Black River Nonpoint TMDL results for fecal coliform bacteria, Winter 91-92				
Sample Site (RM*)	Minimum	Maximum	Mean	Geometric Mean
110th Ave Bridge (RM 21.5)	9	44	19	16
River Street (RM 19.1)	10	99	27	21
Littlerock Trestle (RM 18.7)	6	65	19	14
Wildlife Launch (RM 16.6)	6	580	97	40
Canoe Club (RM 15.3)	5	350	78	37
Black River at Mima (RM 12.7)	17	460	119	64
Sweckers Dock (RM 11.3)	11	630	126	55
Steel Trestle (RM 10.6)	7	445	93	46
Moon Road (RM 7.3)	7	350	70	35
Highway 12 (RM 4.2)	9	190	49	31
Howanut Bridge (RM 1.1)	8	215	51	32
Mima Upstream	3	260	60	25
Mima Creek	2	155	43	23
Beaver Creek	8	4000	707	154
Waddell Creek	2	28	10	7
* River Mile				

Table 2. Year one Black River Nonpoint TMDL Study results for fecal coliform bacteria, Winter 91-92. Results given are means of sample replicates.											
Sample Site (RM*)	12/04/91	12/09/91	01/06/92	01/13/92	01/28/92	02/03/92	02/18/92	02/24/92	03/04/92	03/09/92	
110th Ave. Bridge (RM 21.5)	23	27 S	13 S	10	44	9	10	32	12	10	
River Street (RM 19.1)	21	99	24	18	36	11	16	23	17	10	
Littlerock Trestle (RM 18.7)	32	65 S	14	14	28	6	6	9	10	14	
Wildlife Launch (RM 16.6)	70	47 S	26	15	580 J	53	15	125	31	6	
Canoe Club (RM 15.3)	55	40 S	39	14	350 S	98	9	155	19	5	
Black River at Mima (RM 12.7)	59	42 S	17	18	460 J,S	84	235	215	44	19	
Sweckers Dock (RM 11.3)	62	40 S	17	12	630 J	56 S	170	235 J	34	11	
Steel Trestle (RM 10.6)	120	34 S	22	7	445 J,S	39	120	103	34	11	
Moon Road Bridge (RM 7.3)	86	36	12 S	9	350 J,S	40	75	61	23	7	
Highway 12 Bridge (RM 4.2)	82	32	9	11	190 S	36	51	54 S	20	9	
Howanut Bridge (RM 1.1)	47 J	52	12	12	215 S	49	30	69	21	8	
* River Mile											
S Spreader colony present; number reported is likely underestimated.											
J Fecal coliform colonies positively identified; the reported value is estimated.											

Table 2. Year One Black River Nonpoint TMDL Study results for fecal coliform bacteria, Winter 91-92, continued.  
Results given are means of sample replicates.

Sample Site	12/04/91	12/09/91	01/06/92	01/13/92	01/28/92	02/03/92	02/18/92	02/24/92	03/04/92	03/09/92
Mima Creek Upstream	6	30	3	100	74	3	66	10	260	53
Mima Creek	30	38	2	47	57	3	57	8	155	33 S
Beaver Creek	4000 J	175	46	44	2100	175	69	380	74	8
Waddell Creek	9	9	5	8	28 S	2	15 S	2 U	12	12
<p>S Spreader colony present; number reported is likely underestimated.  J Fecal coliform colonies positively identified; the reported value is estimated.  U The method detection limit.</p>										